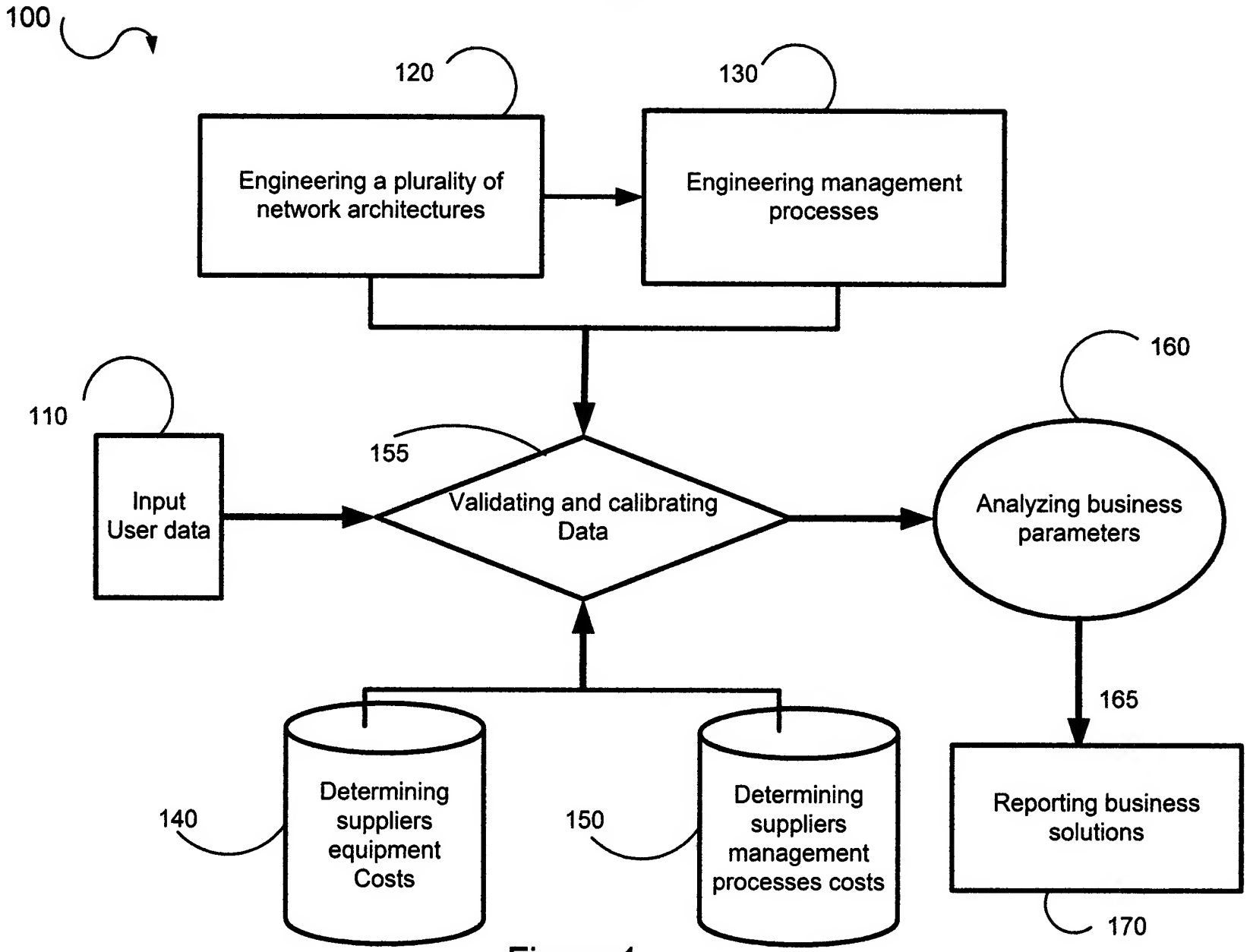
100
120
Engineering a plurality of network architectures
130
Engineering management processes
110
Input User data
155
Validating and calibrating Data
160
Analyzing business parameters
140
Determining suppliers equipment Costs
150
Determining suppliers management processes costs
165
Reporting business solutions
170

Figure 1

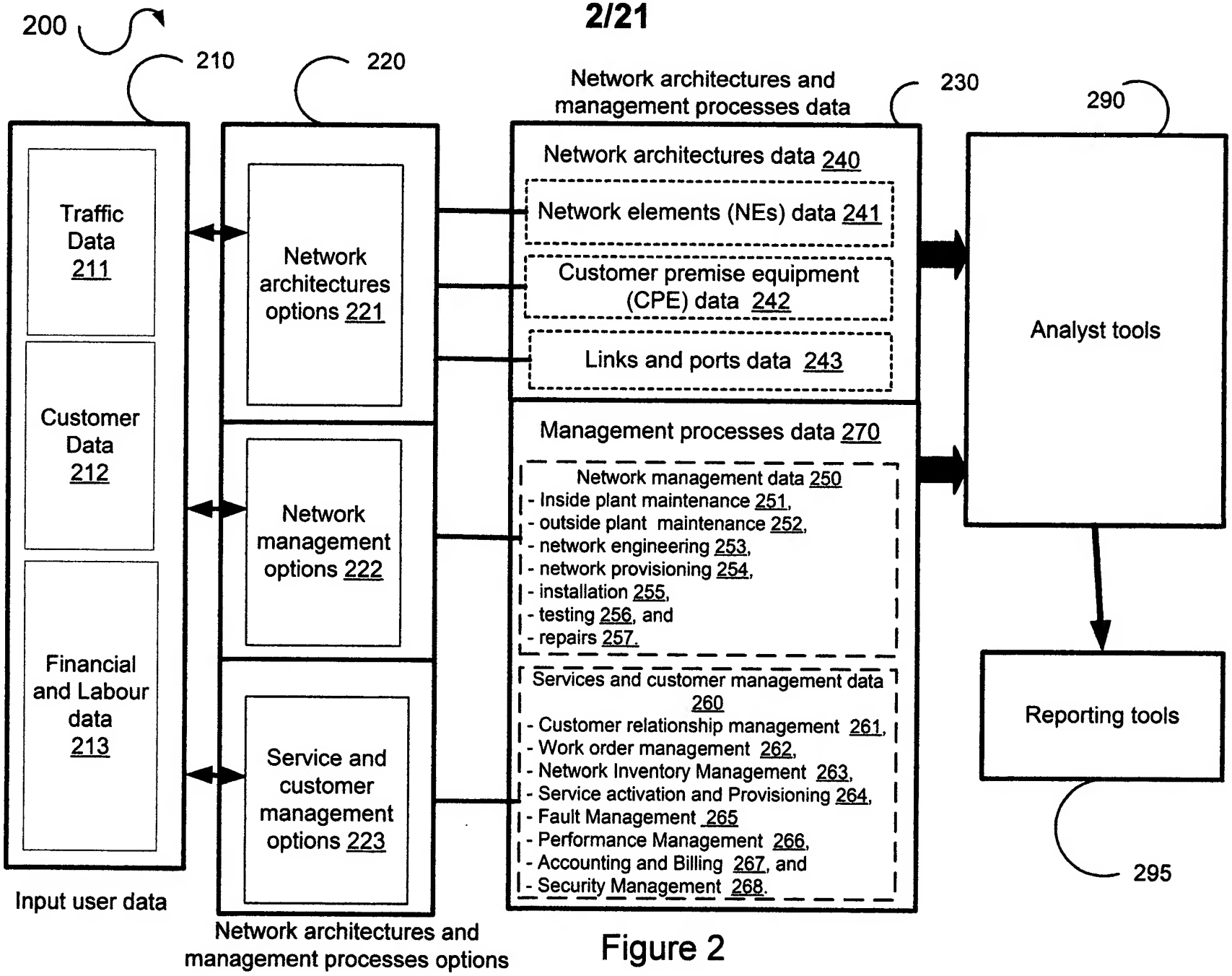
200
210
220
230
290
Traffic Data 211
Customer Data 212
Financial and Labour data 213
Input user data
Network architectures options 221
Network management options 222
Service and customer management options 223
Network architectures and management processes options
Network architectures and management processes data
Network architectures data 240
Network elements (NEs) data 241
Customer premise equipment (CPE) data 242
Links and ports data 243
Management processes data 270
Network management data 250
- Inside plant maintenance 251,
- outside plant maintenance 252,
- network engineering 253,
- network provisioning 254,
- installation 255,
- testing 256, and
- repairs 257.
Services and customer management data 260
- Customer relationship management 261,
- Work order management 262,
- Network Inventory Management 263,
- Service activation and Provisioning 264,
- Fault Management 265
- Performance Management 266,
- Accounting and Billing 267, and
- Security Management 268.
Analyst tools
Reporting tools
295

Figure 2

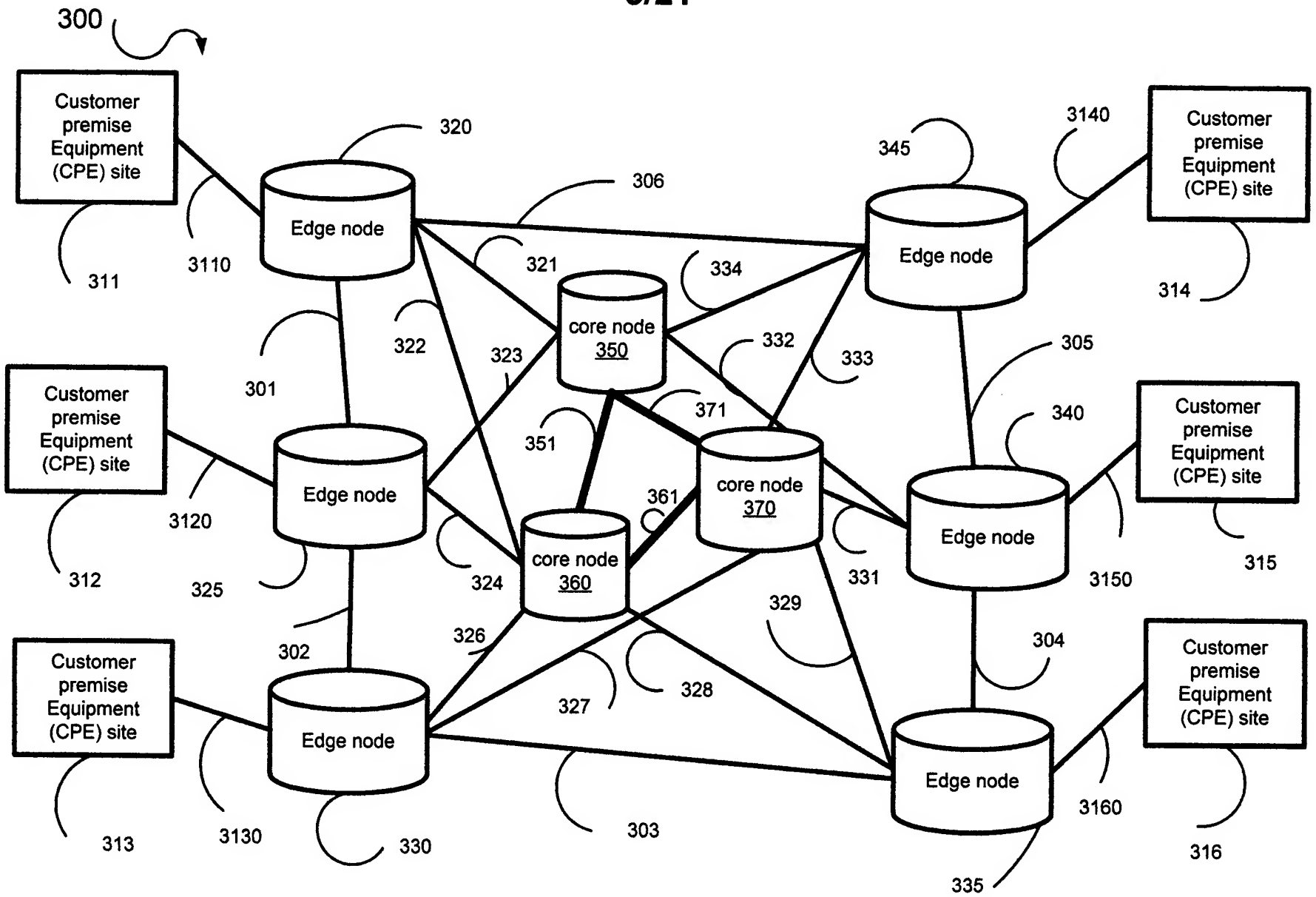
300
Customer premise Equipment (CPE) site
Edge node
core node 350
core node 360
core node 370
311
3110
320
306
321
334
322
323
301
332
333
345
3140
314
305
340
371
351
361
3120
312
325
324
331
3150
315
329
326
302
304
327
328
313
3130
330
303
3160
316
335

Figure 3

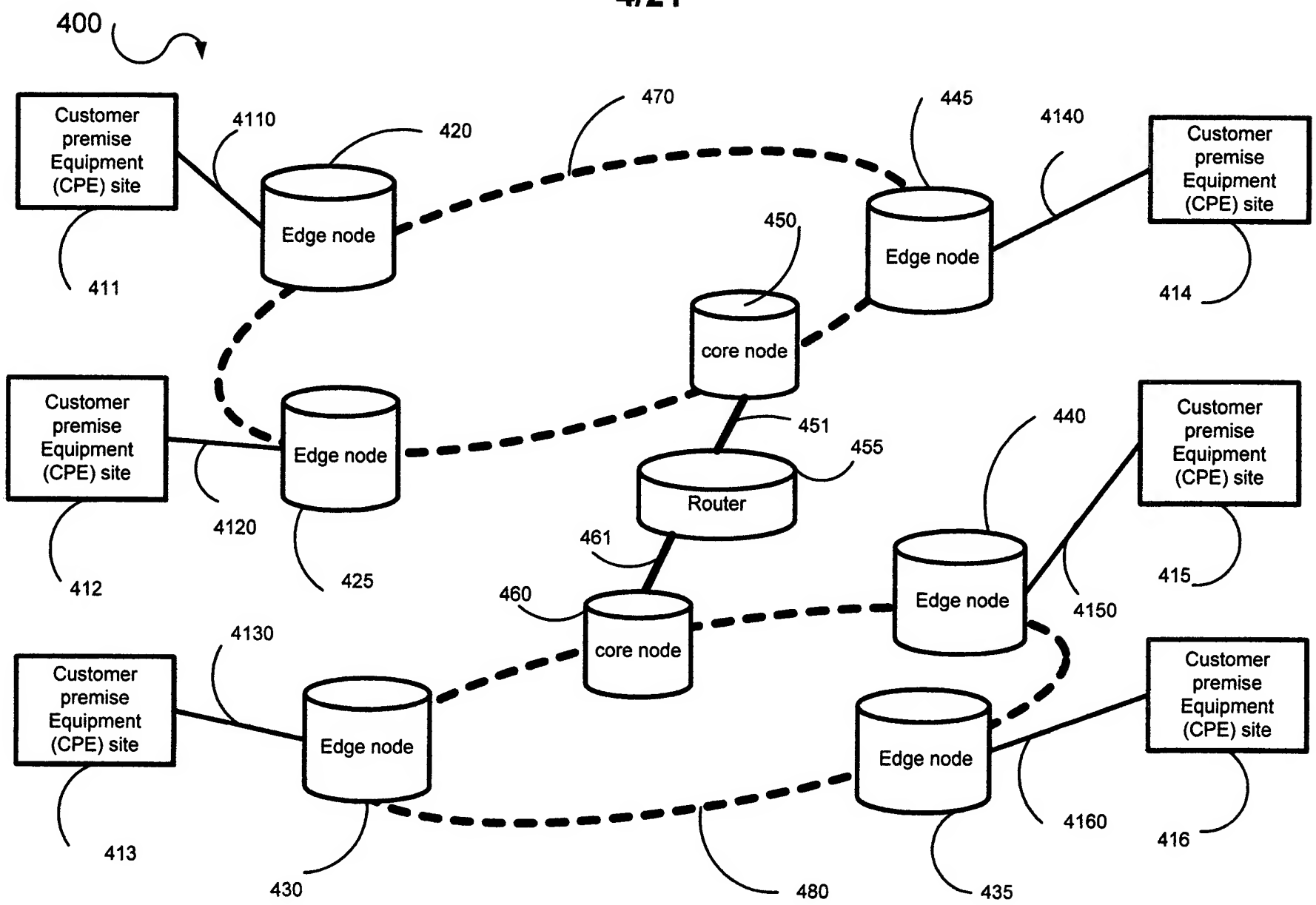
400
Customer premise Equipment (CPE) site
4110
420
470
445
4140
Customer premise Equipment (CPE) site
Edge node
Edge node
411
414
450
core node
Customer premise Equipment (CPE) site
Edge node
451
455
Router
440
Customer premise Equipment (CPE) site
4120
425
461
412
415
460
Edge node
4150
core node
4130
Customer premise Equipment (CPE) site
Edge node
Edge node
Customer premise Equipment (CPE) site
413
4160
416
430
480
435

Figure 4

500

Network Elements (NEs) data

NEs Inventory 510			Owned NEs data 514			Leased NEs data 516			Footprint per NE cost 570	Total footprints cost 575	Power consumption per NE cost 585	Total power consumptions cost 590
			Owned NEs Count 550	Price per NE 555	Total owned NEs cost 560	Leased NEs count 563	Leased per NE cost 565	Total leased NEs cost 580				
Network architecture 1 (ARCH1) 520	Supplier A 501	Switching nodes 521										
		Services nodes 522										
	Supplier B 502	Add/Drop nodes 523										
		Cross-Connect nodes 524										
	Supplier C 503	Other nodes 525										
	ARCH1 totals 526											
Network architecture 2 (ARCH2) 530	Supplier A 504	Switching nodes 531										
		Services nodes 532										
	Supplier B 505	Add/Drop nodes 533										
		Cross-connect nodes 534										
	Supplier C 506	Other nodes 535										
	ARCH2 totals 536											
Network architecture 3 (ARCH3) 540	Supplier A 507	Switching nodes 541										
		Services nodes 542										
	Supplier B 508	Add/Drop nodes 143										
		Cross-connect nodes 544										
	Supplier C 509	Other nodes 545										
	ARCH3 totals 546											

Figure 5

600

Customer premise equipment (CPE) data

CPE Inventory 610			Owned CPE data 614			Leased CPE data 616			Footprints per CPE cost 670	Total footprints cost 675	Power consumptions per CPE cost 685	Total power consumptions cost 690
			Owned CPE Count 650	Price per CPE 655	Total owned CPE cost 660	Leased CPE Count 663	Leased per CPE cost 665	Total leased CPE cost 680				
Network architecture 1 (ARCH1) 620	Supplier A 601	Ethernet switch 621										
		Router 622										
	Supplier B 602	Terminal 623										
	Supplier C 603	Other 624										
	ARCH1 totals 625											
N twork architecture 2 (ARCH2) 630	Supplier A 604	Ethernet switch631										
		Router 632										
	Supplier B 605	Terminal 633										
	Supplier C 606	Other 634										
	ARCH2 totals 635											
Network architecture 3 (ARCH3) 640	Supplier A 607	Ethernet switch 641										
		Router 642										
	Supplier B 608	Terminal 643										
	Supplier C 609	Other 644										
	ARCH3 totals 645											

Figure 6

700

Links and ports data

Links and ports inventory 710			Link trans-mission rate (Mbps) 713	Owned links data 714			Leased links data 716			Leased link per unit length data 718			Leased ports data 753			Access links count 775	Total access capacity (Mbps) 780
				Owned links count 711	Price per link 785	Total owned links cost 790	Leased links count 715	Leased per link cost 749	Total leased links cost 760	Unit length per link count 755	Leased per unit length cost 760	Total leased links for unit length cost 765	Leased ports count 712	Leased per port cost 719	Total leased ports cost 750		
Network architecture 1 (ARCH1) 720	Supplier A 701	T1 721															
		T3 722															
	Supplier B 702	E1 723															
		E3 724															
	Supplier C 703	DSL 725															
		10/100 BT 726															
		100 / 1000 BT 727															
	ARCH1 totals 728																
Network architecture 2 (ARCH2) 730	Supplier A 704	100FX 731															
		OC3 732															
		OC12 733															
		OC48 734															
	Supplier B 705	OC192 735															
	Supplier C 706	DWDM ring 736															
		RPR ring 737															
		1000SX / 1000LX 738															
	ARCH2 totals 739																
Network architecture 3 (ARCH3) 740	Supplier A 707	SONET ring 741															
		Micro wave 742															
	Supplier B 708	100FX 743															
		100 / 1000 BT 744															
	Supplier C 709	DSL 745															
		T3 746															
	ARCH3 totals 747																

Figure 7

800

Customer relationship management (CRM) data

Process name 810	Process cost per link 820		
	Manual operations mode 830	Mechanized operations mode 840	Manual and mechanized operations mode 850
Work order entry and validation process 811			
Service delivery and work order processing process 812			
Customer Care (e.g., security, tool, etc.) process 813			
Trouble Ticketing process 814			
Service assurance and performance reporting process 815			

Figure 8

900

Work Order Management (WOM) data

Process name 910	Process cost per link 920		
	Manual operations mode 930	Mechanized operations mode 940	Manual and mechanized operations mode 950
Work order processing process 911			
Client management (e.g., order display, searches, lists, etc.) process 912			
Report management (e.g., online reports, view reports, store, print, etc.) process 913			
Administration management (e.g., user groups, roles, privileges, etc.) process 914			

Figure 9

Network Inventory Management (NIM) data

Process name 1010	Process cost per link 1020		
	Manual operations mode 1030	Mechanized operations mode 1040	Manual and mechanized operations mode 1050
Customer, services, and resources association management (e.g., information, assign, and design tasks) process 1011			
Equipment management (e.g., bays, shelf, and card assign and design tasks) process 1012			
Network management (e.g., create and delete domain, inventory, assign and design tasks) process 1013			

Figure 10

Service activation and provisioning (SAP) data

Process name 1110	Process cost per link 1120		
	Manual operations mode 1130	Mechanized operations mode 1140	Manual and mechanized operations mode 1150
Create a new service process 1111			
Customer association (e.g., customer data, services, and network updates, audit, trail, etc.) process 1112			
Process for alignment and synchronization of billing, maintenance and performance 1113			
Resource discovery and database quires process 1114			

Figure 11

Fault Management (FM) data

Process name 1210	Process cost per link 1220		
	Manual operations mode 1230	Mechanized operations mode 1240	Manual and mechanized operations mode 1250
Trouble ticketing process 1211			
Isolate problem process 1212			
Analysis and resolution of service logic agreement (SLA) process 1213			

Figure 12

Performance Management (PM) data

Process name 1310	Process cost per link 1320		
	Manual operations mode 1330	Mechanized operations mode 1340	Manual and mechanized operations mode 1350
Collect performance data (e.g., ES, SES, QoS, UAS, etc.) process 1311			
Generate performance reports process 1312			
Validate service logic agreement (SLA) process 1313			

Figure 13

1400

Network management data

1430

Process name 1450	Process cost per NE 1460		
	Manual operations mode 1470	Mechanized operations mode 1480	Manual and mechanized operations mode 1490
Inside plant maintenance 1451			
Outside plant maintenance 1452			
Network engineering 1453			
Network provisioning 1454			
Installation 1455			
Testing 1456			
Repairs 1457			

1410

Architecture name 1413	Options 1415
ARCH1 14131	1
ARCH2 14132	1
ARCH3 14133	1
ARCH4 14134	1
ARCH5 14135	1
ARCH6 14136	0
ARCH7 14137	0
ARCH8 14138	0
ARCH9 14139	0
ARCH10 14140	0

Network Architectures options

1420

Process name 1423	Options 1425
CRM 14231	1
WOM 14232	1
NIM 14233	1
SAP 14234	1
FM 14235	1
PM 14236	1
Billing & Accounting 14237	0
Security Management 14238	0

Service & customer management options

Figure 14

Network management options 1510

Process name 1505	Options 1515
Inside plant maintenance 15051	1
Outside plant maintenance 15052	0
Network engineering 15053	1
Network provisioning 15054	1
Installation 15055	0
Testing 15056	1
Repairs 15057	1

1530 Customer data

Parameter name 1533	Value 1535
Number of customer sites per NE 15331	
Number of buildings 15332	
Building entry cost 15333	
Leased per building cost 15334	

1520 Traffic data

Parameter name 1523	Value 1525
Revenue per Mbps 15230	
Percentage revenue generated bandwidth 15231	
Average busy hour traffic per user (bps) 15232	
Percentage intra-domain traffic 15233	
Percentage inter-domain traffic 15234	
Mean duration of a voice call (seconds) 15235	
Payload rate per user (bps) 15236	
Percentage voice link utilization 15237	
Percentage increase in capacity 15238	
Average bandwidth per link (Mbps) 15239	

Figure 15

Financial and labour data

Parameter name 1610	Value 1630
Depreciation period in a pre-defined time period 1611	
Cost of capital (Interest rate) in the pre-defined time period 1612	
Percentage Sales, general, & administration (SG&A) in the pre-defined time period 1613	
Tax rate in the pre-defined time period 1614	
Percentage salvage value in the pre-defined time period 1615	
Life time period 1616	
Total number of payments in the pre-defined period 1617	
Operations error rate in the pre-defined time period 1618	
Percentage lost opportunity revenue in the pre-defined time period 1619	
Percentage operating margin in the pre-defined time period 1620	
Dedicated work hours per day 1621	
Days per month 1622	
Months per year 1623	
Loaded labour rate per hour 1624	
Installer travel cost 1625	
Connection to customer's patch panel per link cost 1626	

Figure 16

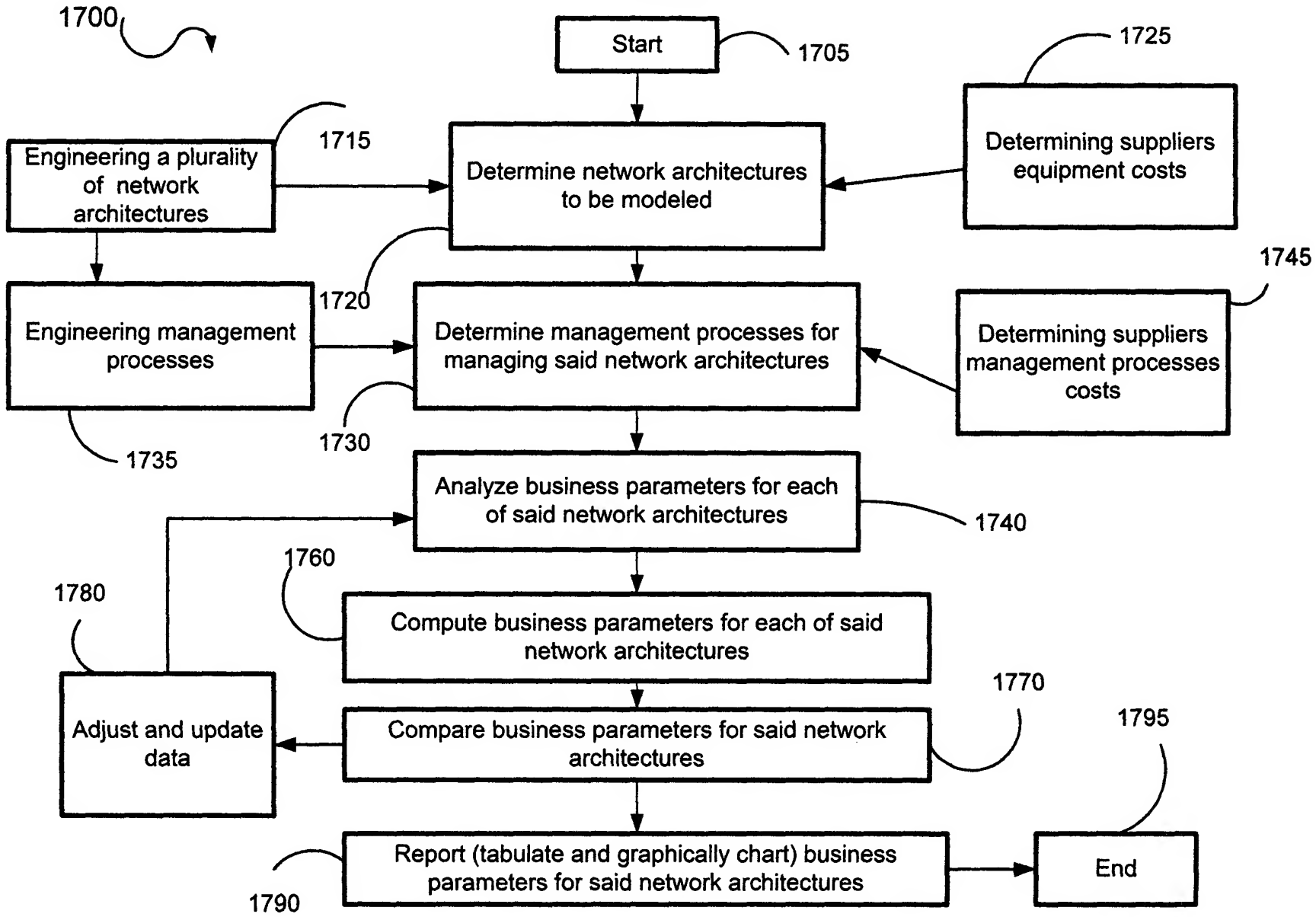
1700
Start
1705
1725
Determining suppliers equipment costs
1715
Engineering a plurality of network architectures
Determine network architectures to be modeled
1720
1745
Engineering management processes
Determine management processes for managing said network architectures
Determining suppliers management processes costs
1735
1730
Analyze business parameters for each of said network architectures
1740
1760
1780
Compute business parameters for each of said network architectures
1770
Adjust and update data
Compare business parameters for said network architectures
1795
Report (tabulate and graphically chart) business parameters for said network architectures
End
1790

Figure 17

1800

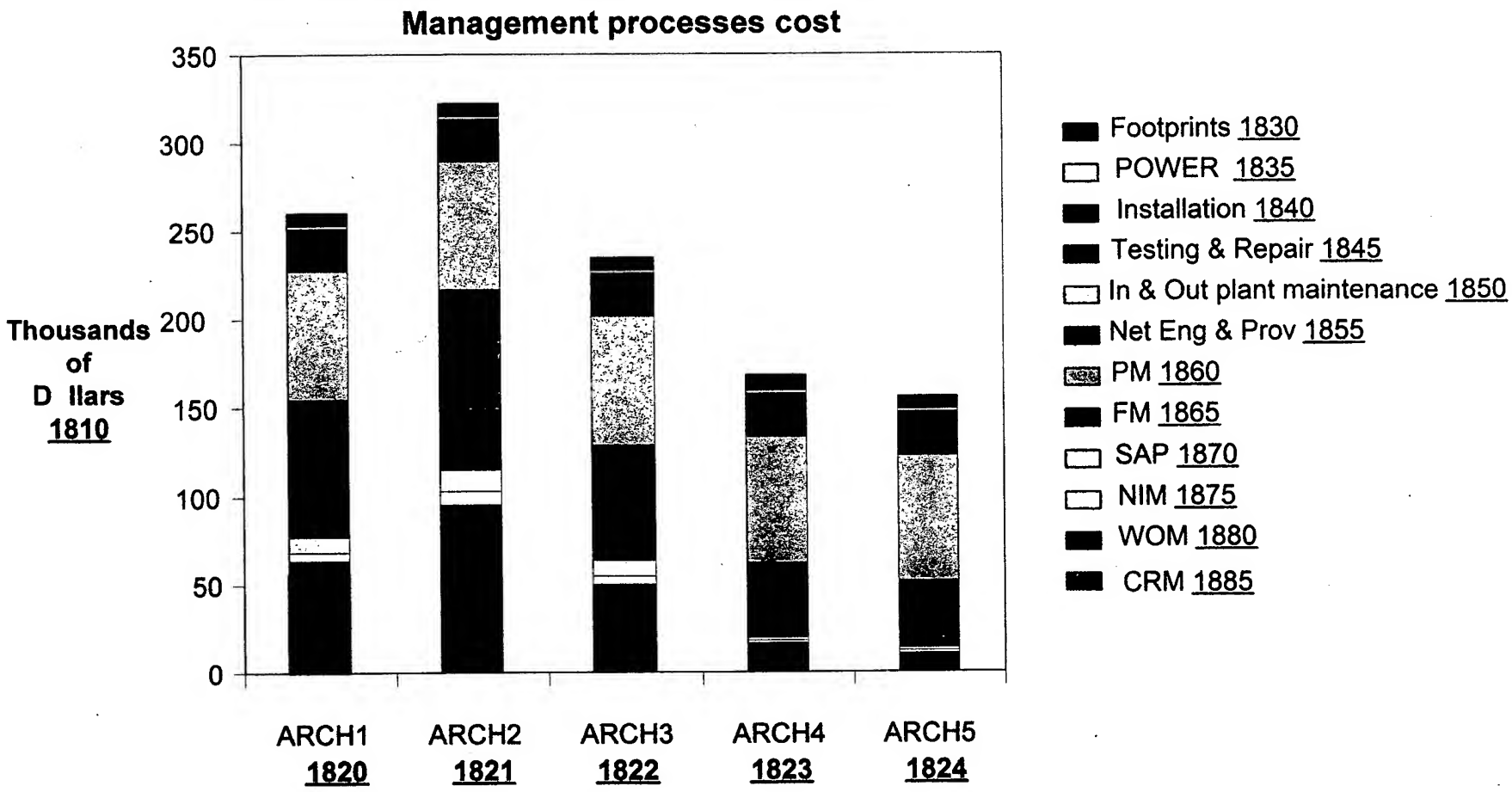

Figure 18

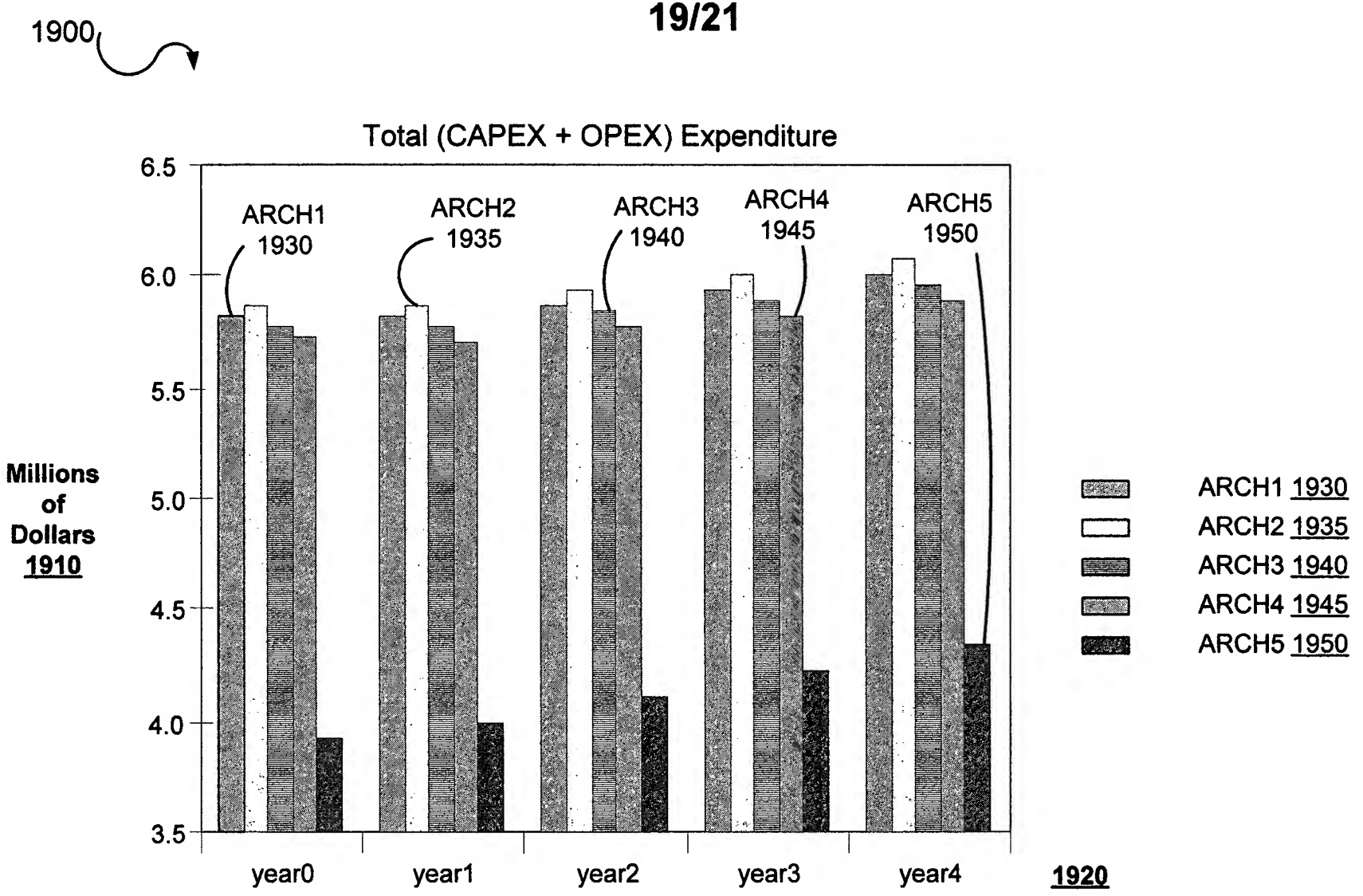
1900
Total (CAPEX + OPEX) Expenditure
6.5
6.0
5.5
5.0
4.5
4.0
3.5
Millions of Dollars 1910
ARCH1 1930
ARCH2 1935
ARCH3 1940
ARCH4 1945
ARCH5 1950
year0
year1
year2
year3
year4
1920
ARCH1 1930
ARCH2 1935
ARCH3 1940
ARCH4 1945
ARCH5 1950

Figure 19

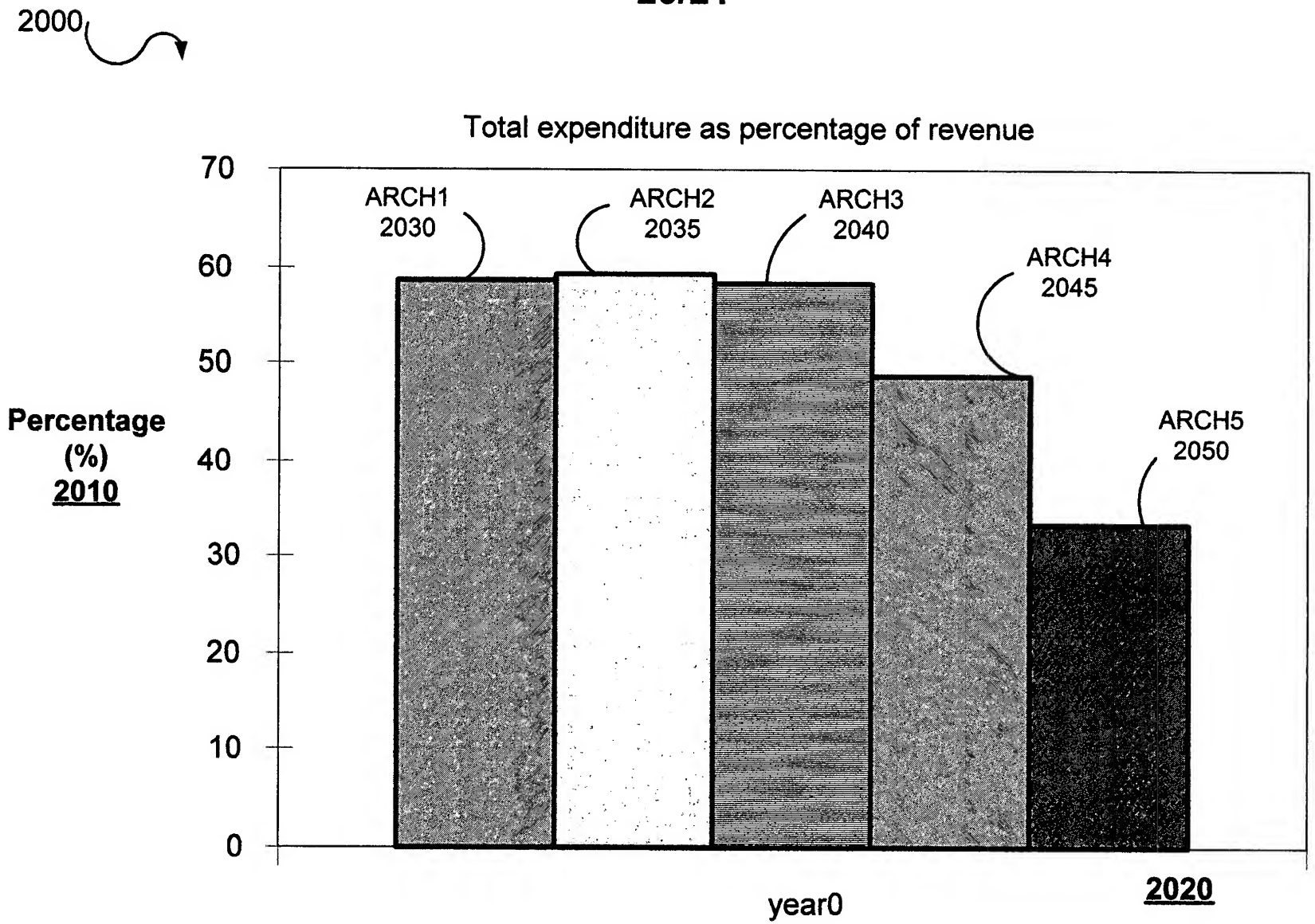
2000
Total expenditure as percentage of revenue
70
60
50
40
30
20
10
0
Percentage
(%)
2010
ARCH1
2030
ARCH2
2035
ARCH3
2040
ARCH4
2045
ARCH5
2050
year0
2020

Figure 20

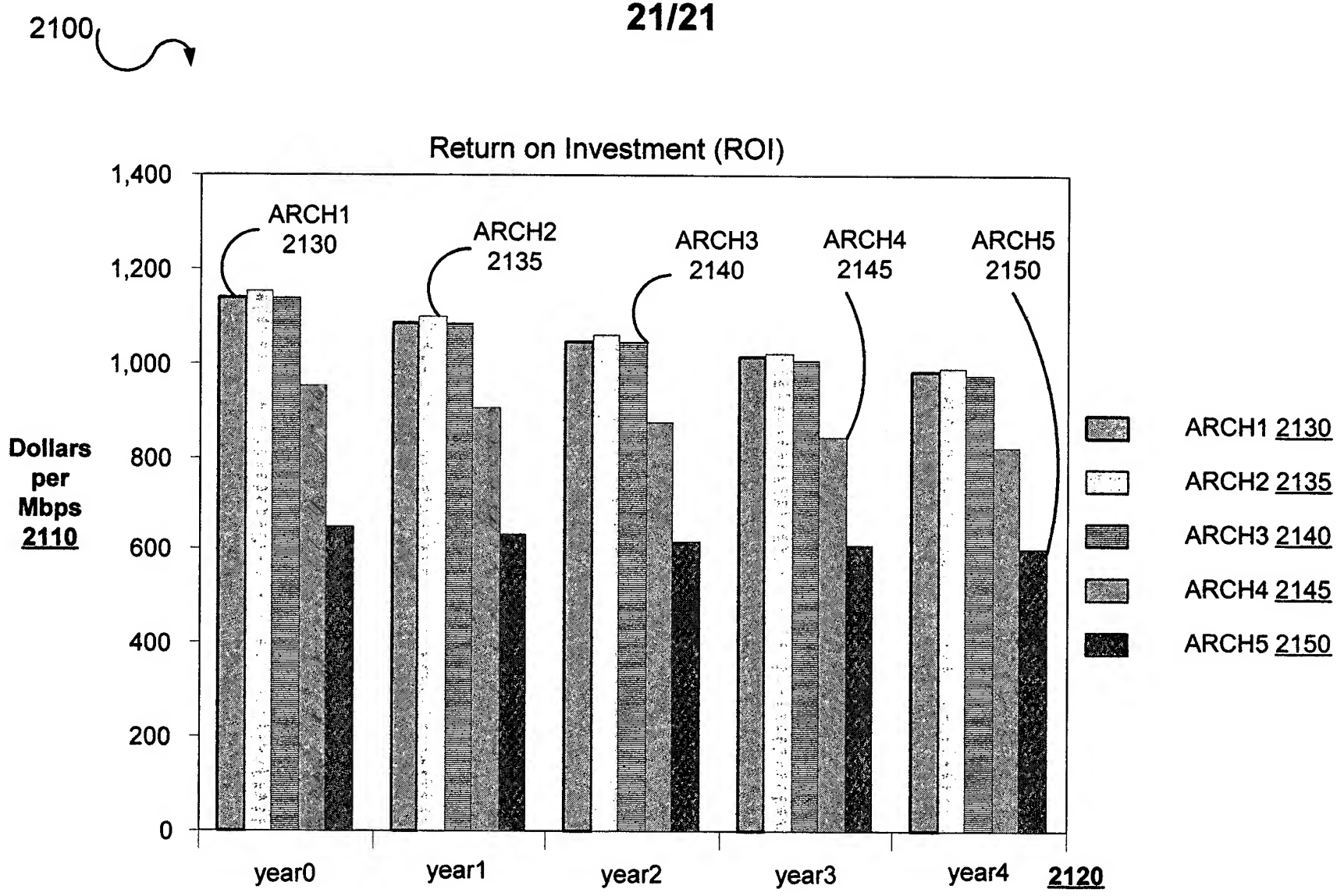
2100
Return on Investment (ROI)
1,400
1,200
1,000
800
600
400
200
0
Dollars per Mbps 2110
ARCH1 2130
ARCH2 2135
ARCH3 2140
ARCH4 2145
ARCH5 2150
year0
year1
year2
year3
year4
2120
ARCH1 2130
ARCH2 2135
ARCH3 2140
ARCH4 2145
ARCH5 2150

Figure 21